REMARKS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested. Claims 1-8 remain pending in the present Application. No new matter has been added.

By way of summary, the Official Action presents the following issue: Claims 1-8 are rejected under 35 U.S.C. § 102 as being anticipated by Coulson et al. ("A Statistical Basis for Longnormal Shadowing Effects in Multipath Fading Channels", hereinafter "Coulson").

REJECTION UNDER 35 U.S.C. § 102

The outstanding Official Action has rejected Claims 1-8 under 35 U.S.C. § 102 as being unpatentable over Coulson. The Official Action states that Coulson discloses all of the Applicants' claim features. Applicants respectfully traverse the rejection.

Claim 1 recites, *inter alia*, a time-varying multi-path generating apparatus for simulating multi-path fluctuations in radio communications, having:

> ... time-varying amplitude functions are aligned serially in the time domain such that a time-varying shadow amplitude function is obtained, which is repeated N times, where N represents the number of the propagation paths, resulting in N time-varying shadow amplitude functions,
>
> the time-varying phase functions are aligned serially in the time domain such that a time-varying shadow phase function is obtained, which is repeated N times, where N represents the number of the propagation paths, resulting in N time-varying shadow phase functions,
>
> an initial amplitude, an initial phase, an initial time delay, and an initial arrival direction are generated as the propagation path parameters of a propagation path using random numbers provided by the random number generating unit based on the initial value generation parameters stored in the data storage unit, and
>
> the time-varying shadow amplitude functions and the time-varying shadow phase functions are superimposed on the initial amplitude and the initial phase, respectively, for generating a plurality of time-varying propagation paths. (emphasis added)

By way of background, in mobile communication systems, signals are exchanged between a base station and a mobile terminal in a multiple propagation paths. These multiple paths are established by reflection and diffraction due to obstacles in the communication path.[1] As can be appreciated, depending upon the propagation path, a signal power may decrease due to the number of reflections and diffractions. For example, as shown in Figure 2, the time delay and received power of a propagation path change as a mobile terminal moves throughout a coverage area. Thus, to design such systems, a simulator is typically utilized to determine optimal system parameter values which may be affected by such reflections and diffractions. This simulator, known as a fading simulator, is used to evaluate the transmission quality of a mobile communication system. The fading simulator applies fading to a modulated signal of a transmitter and outputs the faded modulated signal to the receiver. The fading simulator superimposes a modulating signal on a carrier propagation path with a time delay specified by a fading profile model. Such profile models include Rayleigh fading or Nakagami-Rice fading which, when employed in a simulator, model power level fluctuations. However, such fading simulators are not well suited to fourth generation (4G) communication systems as they do not precisely model time variation characteristics of each propagation path, nor do they model the movement of the obstacles causing a shadowing (blocking) of a propagation path. Moreover, such models do not provide a meaningful correlation between propagation paths for obstacles which would interfere with more than one propagation paths.[2]

In light of at least the above deficiencies in the art, the present advancements are provided. With at least the above objects in mind, a brief comparison of the claim advancement in view of the cited reference is believed to be in order.

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[1] See Figure 1.
[2] Application, pages 1-6.

Coulson describes an empirical explanation of the lognormal and Rayleigh distribution for describing multi path fading. At section II a description of wide-bend fading channels is provided in terms of a mathematical model. At section III the central limit theorem (CLT) is applied to both the lognormal and Rayleigh models. As noted in Table 2, Rayleigh Lognormal and Suzuki distributions were compared to a range of variants.[3] As noted in the Conclusion, observations with respect to each of the Lognormal Suzuki and Rayleigh distributions were identified for determining which model characteristics were best applied to a given channel behavior.

Conversely, in an exemplary embodiment of the Applicant's claim advancements, a time-varying multi-path generating apparatus is provided for simulating multi-path fluctuations in radio communications. The apparatus includes a plurality of time-varying amplitude functions and a plurality of time-varying phase functions generated based on parameters and data files for propagation path generation. The parameters and the data files are stored in the data storage unit and random numbers are generated by random number generating unit. The time-varying amplitude functions are aligned serially in the time domain such that a time-varying shadow amplitude function is obtained. This process is repeated N times, where N represents the number of the propagation path, resulting in N time-varying shadow amplitude functions. The time-varying phase functions are aligned serially in the time domain such that the time-varying shadow phase function is obtained. This process is repeated N times where N represents the number of the propagation paths, resulting in N time-varying shadow phase functions. An initial amplitude, an initial phase, an initial time delay, and an initial arrival direction are generated as the propagation path parameters of a propagation path using the random number provided by the random number generating unit based on an initial value generation parameter stored in the data storage unit. The time-

[3] See Coulson at page 497-500.

varying shadow amplitude functions and the time-varying phase functions are superimposed on an initial amplitude and initial phase, respectively, generating a plurality of time-varying propagation paths.

As Coulson does not disclose or suggest generating a plurality of time-varying propagation path including N time-varying shadow amplitude functions N time-varying shadow phase functions. Likewise, Coulson does not disclose or suggest superimposing N time-varying shadow amplitude functions and N time-varying shadow phase functions on an initial amplitude and an initial phase to generate a plurality of time-varying propagation path as recited in Claim 1 or any claims depending therefrom. Likewise, as independent Claims 2 and 6-8 recite substantially similar limitations to that discussed above, Applicants respectfully submit that these claims are likewise allowable.

Accordingly, Applicants respectfully request the rejection of Claims 1-8 under 35 U.S.C. § 102 be withdrawn.

CONCLUSION

Consequently, in view of the foregoing remarks, it is respectfully submitted that the present application, including Claims 1-8, is patentably distinguishing over the prior art, in condition for allowance, and such action is respectfully requested at an early date.

Respectfully submitted,

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